Amendments to the Drawings:

The attached four sheets of drawing, which include all of the drawing figures, replace all of the originally filed drawing sheets (five sheets) and satisfy the drawing requirements of the Patent and Trademark Office. The fourth attached sheet contains Figs. 4 and 5, which originally were presented on separate sheets.

Attachment: Four Replacement Sheets

REMARKS

Corrected drawings are submitted herewith.

With respect to the objection to the specification, the applicant points out that one dictionary meaning of "average" is "a less than total loss sustained by a ship or cargo" - *Webster's New Collegiate Dictionary.* See also *The American Heritage Dictionary of the English Language: Fourth Edition.* Accordingly, it is submitted that "average" is quite descriptive and accurate as it is used in the specification. If, despite this meaning, the Examiner finds that "average" is unacceptable, he is hereby authorized to change it to "collision" by Examiner's Amendment.

By the present Amendment, the indefinite language pointed out by the Examiner in the rejection under 35 USC 112 has been deleted. The expression "high breaking elongation" has been deleted in favor of "breaking elongation high enough to enable the inner shell to deform without developing a break in most ship collisions". This feature of the invention is disclosed in, for example, in lines 9-14 on page 2 of the application: "In case of stronger collisions or forces acting at an unfavourable angle, the forces can also act on the inner shell, and since this, however, has been produced from a highly resilient steel with high breaking elongation, the inner shell can deform such that no cracks appear thereby." With respect to "most ship collisions", lines 14-17 on page 2 of the application disclose: "Only with very large forces the inner shell can be destroyed as well, which should only be the case in not more than 3% of the accidents known from statistics, though." Lines 21-24 on page 9 of the application add: "It can be taken from FIG. 4 as well that the inner shell 11 has been softly deformed, without a break being developed. There are steels, which are suitable for such a strain and in particular have a high breaking

elongation." Once a person of ordinary skill is taught by the present application that steel with a high breaking elongation should be used to avoid cracks as a result of deformation, that person can determine without undue experimentation how high the breaking elongation should be in order to avoid cracks in most collisions. The important thing with respect to this feature is that the present invention discloses to one of ordinary skill that steel with a high breaking elongation should be used in the inner shell to avoid cracks as a result of deformation.

Reconsideration of the rejection of claims 1-8 under 35 USC 103 as being obvious over the McLaughlin reference is respectfully requested. It can be seen from the drawings, and probably more easily from the corrected drawings because the dark areas have been lightened, and especially from Fig. 4, that the rated break points in the embodiment illustrated in Fig. 4 comprise a series of round holes 20, the webs between many of which have already been torn apart due to the force associated with a collision. Neither the unnumbered larger, elongate openings in the connecting elements of Figs. 1-4 nor the material extending between adjacent ones of those elongate openings constitutes the rated break points of the present invention. Unlike the rated break points of the present invention, neither the larger, elongate openings in the connecting elements of Figs. 1-4 nor the material extending between adjacent elongate openings was chosen or designed to tear open in response to a collision in order to prevent the cracking or other failure of the inner shell. On the other hand, as is disclosed at page 9, line 25 to page 10, line 6, the three elongated holes 20 of the embodiment of Fig. 5 are designed to tear open to protect the inner shell.

By the present Amendment, claim 1 has been amended to recite that at least some of the connecting elements are provided with rated break points 20 that tear open upon the imposition

of a force on the double shell tank ship that is less than a force that would deform the inner shell, whereby deformation of the inner shell is reduced or prevented. In this regard, lines 17-23 on page 3 of the application disclose that, in the case of forces acting from the outside onto the hull of a ship according to the invention, the rated break points in direct proximity of this force effect are excessively strained and tear open at the predetermined points, and that the inner shell is not damaged thereby. The term "rated" in claim 1 makes clear that the break points are designed to have a certain strength, and "that tear open upon the imposition of a force on the double shell tank ship that is less than a force that would deform the inner shell" specifies the amount of that strength in terms of the function that the break points must perform. Not just any size or shape of opening and material associated with such opening will perform the desired function. Without the disclosure of the present application, break points having the needed strength will not be provided, and the inner shell will not be adequately protected in the event of a collision. However, once one of ordinary skill in the art is instructed that rated break points should be used to protect the inner shell, the rated break points can be constructed to perform the desired function without undue experimentation.

With respect to the term "rated", submitted herewith is a copy of a publication entitled "477 kcmil, 3M Brand Composite Conductor, Mechanical Properties, Breaking Strength" by Kamal Amin, June 1, 2003 (hereinafter the "3M publication"). The 3M publication uses the expression "Rated Breaking Strength" (RBS) and makes clear that the "Rated Breaking Strength" is a specific strength. As can be seen under the Test Results table in the 3M publication, the Rated Breaking Strength in that example is 19,476 Lbs. Of course, the Rated Breaking Strength of the 3M publication would not necessarily equal the strength of the rated

break points of the present invention. The important thing is that "rated" means a specific strength.

McLaughlin discloses a double hull ship having an aluminum cryogenic liquid holding tank. The double hull 14 includes an inner hull 17 connected to an outer hull 18 by perforated stringers 20 and transverse bulkheads 21. There appears to be no further disclosure concerning the perforated stringers 20 and transverse bulkheads 21. There are also spacing elements between the inner hull 17 of the double-hull structure 14 and the aluminum tank 10. This can be best seen from Figure 2 of McLaughlin. On the right-hand side there is shown the aluminum tank 10. Then, there is a stringer 16 that connects the aluminum tank 10 to the inner hull 17 of the double-hull structure. There are perforations 50 in the different transition stringers of stainless steel and aluminum in McLaughlin, but neither the perforations 50 nor the unnumbered perforations in the stringers 20 and transverse bulkheads 21 of McLaughlin constitute, in terms of claim 1, rated break points that tear open upon the imposition of a force on the double shell tank ship that is less than a force that would deform the inner shell. In fact, there is a statement in column 6 of McLaughlin, starting with line 50, explaining that the perforations 50 are provided for air circulation through the sealed space between the aluminum tank 10 and the inner hull 17.

There is no suggestion that the perforations of the McLaughlin reference are rated break points that, in the terms of amended claim 1, "tear open upon the imposition of a force on the double shell tank ship that is less than a force that would deform the inner shell". Furthermore, the perforations in McLaughlin do not inherently satisfy that limitation. Moreover, in the absence of a disclosure that the perforations of McLaughlin are rated break points that tear open upon the imposition of a force on the double shell tank ship that is less than a force that would

deform the inner shell, there is no reason for one of ordinary skill to expect that the perforations of McLaughlin would act as rated break points that tear open upon the imposition of a force on the double shell tank ship that is less than a force that would deform the inner shell. In this regard, the perforations of McLaughlin are more like the larger, elongate openings in the connecting elements of Figs. 1-4 of the present application than they are like the rated breaking points of claim 1.

McLaughlin also fails to disclose the feature of claim 1 of an inner shell made of a steel having a breaking elongation high enough to enable the inner shell to deform without developing a break in most ship collisions. Furthermore, the inner shell 17 of McLaughlin is not inherently made of a steel having a breaking elongation high enough to enable the inner shell to deform without developing a break in most ship collisions.

The Fischer et al. reference discloses a double hull structure having a controllably crushable stand-off structure for maintaining a separation between inner and outer hulls. In the Abstract of Fischer et al., there is a statement of the reason for this controllably crushable stand-off structure, which is to provide sequential failure by sequential energy absorbing brittle fractures. Between the inner hull 14 and the outer hull 16 there is thermal insulation, because the tank of the ship is used for liquified natural gas. The Fischer et al. reference does not disclose the features of claim 1 of the present application.

In view of the foregoing, it is submitted that all of the claims are allowable and that the application is in condition for allowance. An early notice to that effect is respectfully requested.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0562.

Respectfully submitted,

Date: 3-26-08

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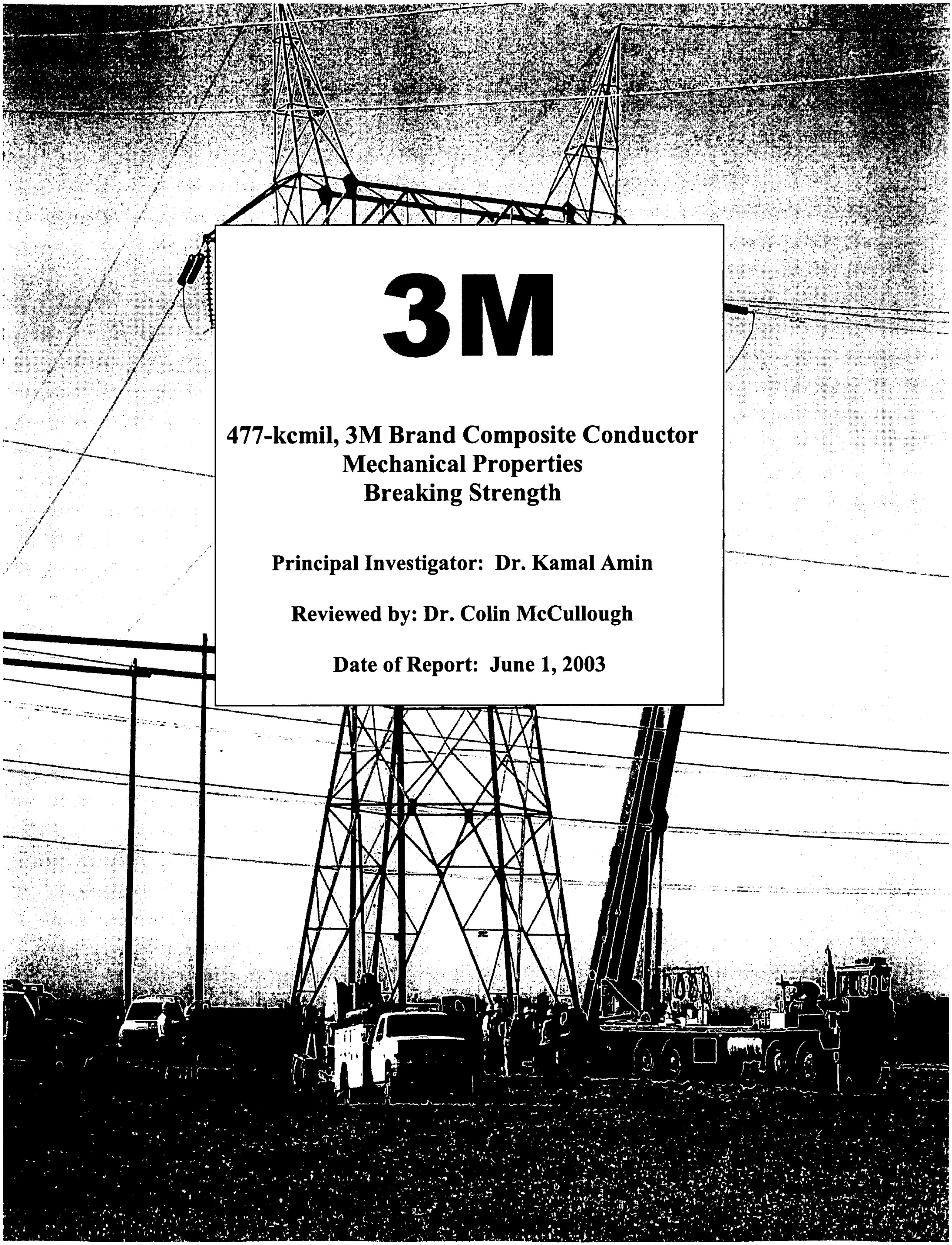


3M

477-kcmil, 3M Brand Composite Conductor
Mechanical Properties
Breaking Strength

Principal Investigator: Dr. Kamal Amin

Reviewed by: Dr. Colin McCullough

Date of Report: June 1, 2003

477 kcmil, 3M Brand Composite Conductor
Mechanical Properties
Breaking Strength

Summary:

The load to failure of 477-kcmil 3M Brand Composite Conductor was measured from tension tests. Tested samples produced loads to failure in the conductor above 100% RBS (Rated Breaking Strength).

Samples;

477-kcmil 3M Composite Conductor were cut to lengths of 10ft (3.05m) and 20ft (6.1m), and fitted with resin terminations at both ends.

Equipment Used:

The shorter 10ft samples were tested at the Xcel Energy test laboratories in Minneapolis, MN, in a horizontal tensile machine with a Sheffer Hydraulic ram. The load cell was a BLH Type T2P1 load cell with a maximum capacity of 50,000 lbs. The digital readout was a Daytronics Model 3270P, accurate to 10 Lbs. The longer samples were tested at NEETRAC (National Electric Energy Testing Research and Applications Center) in Atlanta, GA, and were terminated using resin terminations. In this case an MTS Servo-hydraulic tensile machine, Control # CQ 0195 was used, with a Dynamics Research Corporation (DRC)/NEETRAC cable extensometer, Control # CQ 3002, and a National Instruments AT-MIO-16XE-50 computer data acquisition interface.

Conductor Specification:

See Appendix A

Procedure:

477-kcmil 3M Composite Conductor samples of length 10ft (3.05m) were cut from a spool supply and terminated at each end using a resin wire-lock system cast into cast iron spelter-sockets. Hose clamps were applied 11in from each end and the aluminum strands were cut about 3in from the end to expose the core. The aluminum strands over the remaining 8in were flared open (moving both layers in a direction opposite to the stranding direction). Next the tape was removed from the core over the 8in length and the aluminum strands moved back in the stranding direction but left flared to allow for cleaning. The cables were hung vertically and the ends submerged in an ultrasonic bath containing MEK (Methyl Ethyl Ketone) as the cleaning solution. Samples were removed from the ultrasonic bath after 20 minutes, dried using an air blower and then hung vertically in the spelter-socket using a fixture. Resin (wire-lock compound) was prepared and poured into the metal ends. Samples were left to allow the resin to cure prior to testing. The longer length samples were prepared using a similar procedure, and required ring clamps around the conductor free ends during handling, cutting, and end

preparation. This preserves the "as-manufactured" placement of the conductor components, and ensures each layer is loaded realistically during testing

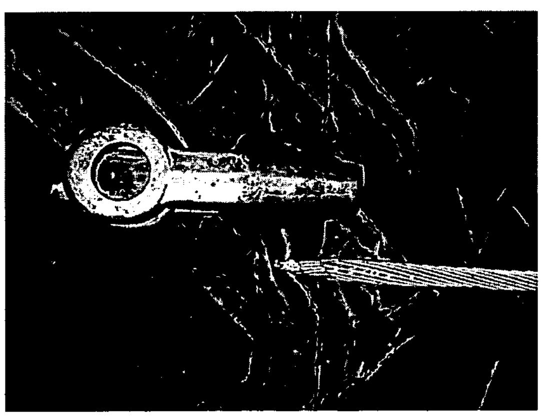
Testing of the short samples utilized a preload to 25% RBS and then holding the load for 10 minutes, followed by reloading at a rate of 5000 Lbs/minute to failure. The load was displayed on a counter and recorded manually along with any details of acoustic cracking noise or other observations. After testing, the failure location was recorded and the aluminum strands were removed and the core examined. The longer samples were loaded uniformly at a rate of 10,000 Lbs/min to failure, with the free-span conductor length of 19 feet (5.6m).

Test Results:

The following table summarizes load to failure, failure location and comments:

Failure Load, (Lbs)	Failure Load, (kN)	%RBS	Gauge Length (ft)	Comments
21040	93.6	108%	10	In gage 30" from resin end
19140	85.1	98%	10	In resin termination
19620	87.3	101%	10	In resin termination
19780	88.0	102%	10	In conductor at 1/3 gage
20400	90.7	105%	19	At end of resin termination
21070	93.7	108%	19	Failed in mid span (after stress-strain test)
19640	87.3	101%	10	At end of resin termination

RBS = 19,476 Lbs



A typical conductor failure at the epoxy end

All but one sample failed at loads > 100% RBS. The one test sample that failed below 100% RBS, did so at a resin termination, rather than in the gauge length. Thus, the test is affected by the resin termination. ANSI C119.4 (1998) – section 4.4.3 for full tension connectors, gives some guidance to the acceptance criteria. Recognizing that failure is often within the termination, the connector should hold at least 95% of the conductor's rated breaking strength when failure occurs in the termination. Thus, the test

that failed at 98% RBS suggests the conductor strength is, with high probability, satisfactory.

Conclusion

Tensile tests performed on 477-kcmil 3M Composite Conductor indicate the conductor meets the Rated Breaking Strength.

Appendix A: 477 kcmil, 3M Composite Conductor Specification

Conductor Physical Properties		
Designation		477-T16
Stranding		26/7
kcmils	kcmil	477
Diameter		
indiv Core	in	0.105
indiv Al	in	0.135
Core	in	0.32
Total Diameter	in	0.86
Area		
Al	in^2	0.374
Total Area	in^2	0.435
Weight	lbs/linear ft	0.539
Breaking Load		
Core	lbs	11,632
Aluminum	lbs	7,844
Complete Cable	lbs	19,476
Modulus		
Core	Msi	31.4
Aluminum	Msi	8.0
Complete Cable	Msi	11.2
Thermal Elongation		
Core	10^-6/F	3.5
Aluminum	10^-6/F	12.8
Complete Cable	10^-6/F	9.2
Heat Capacity		
Core	W-sec/ft-C	13
Aluminum	W-sec/ft-C	194

Conductor Electrical Properties		
Resistance		
DC @ 20C	ohms/mile	0.1832
AC @ 25C	ohms/mile	0.1875
AC @ 50C	ohms/mile	0.2061
AC @ 75C	ohms/mile	0.2247
Geometric Mean Radius	ft	0.0290
Reactance (1 ft Spacing, 60hz)		
Inductive Xa	ohms/mile	0.4296
Capacitive X'a	ohms/mile	0.0988